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PRINCIPAL INSTRUCTIONAL LEADERSHIP AND TEACHER SELF-EFFICACY AS A MEDIATING VARIABLE BETWEEN TEACHER LEADERSHIP AND TEACHER PROFESSIONAL LEARNING PRACTICES IN SECONDARY SCHOOLS IN KELANTAN

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ABSTRACT

Empirical studies examining the impact of principal instructional leadership (PIL) as well as teacher self-efficacy (TSE) as a mediator to teacher leadership (TL) on teacher professional learning (TPL) practices are minimal. Theoretically, this study provides empirical evidence through the application of four models, namely the Leadership Development for Teachers (LDT), the PIL Model, the TSE Model, and the TPL Model, to enrich the understanding of TPL. Employing Structural Equation Modelling (SEM) analysis, survey data were collected from 522 teachers in secondary schools in Kelantan. The research strategy that has been used is a cross-sectional quantitative survey. The data were analyzed utilising the partial least squares structural equation modeling (PLS-SEM) to evaluate the direct and indirect effects of TL on professional learning practices. The results indicate that both PIL as a construct and TSE influence TL and TPL practices. In other words, teachers and principals with power as well as support are likely to deliberate and actively notice learning opportunities. This study takes a holistic approach by analyzing all of the components related to good leadership in education. Such insights shed light on how school policymakers and administrators can create atmospheres that promote ongoing professional development for teachers. In the future, it might be beneficial for researchers to investigate similar dynamics in other types of educational institutions in order to broaden our knowledge of ways to encourage various kinds of TPL.

Keywords: **teacher leadership, principal instructional leadership, teacher self-efficacy, teacher professional learning**

INTRODUCTION

Educational leadership is a significant aspect of a particular setting and is influential on the educational setting and student achievement in secondary school education (Raman et al., 2022; Thien et al., 2023). Thus, it is observed that this area of study has shown significant development globally, as most research has been conducted due to a lack of knowledge. Moreover, these studies are valuable to policymakers who are concerned with formulating different policies regarding the leadership role of both teachers and school principals, which specifically applies to their roles as instructors. The ideas expressed by Bellibaş et al. (2021) state that contemporary educational leadership concerns a more globalized and collaborative educational model and it does not delegate responsibility to a single individual on all or any levels of school governance. Simply, it means that their role has changed so that no school leader can be held accountable for the school's success solely or at least to a significant extent. Additionally, Bellibaş et al. (2020) support the idea that teacher leadership (TL) and principal's instructional leadership are two important factors that are likely to have a considerable impact on a number of school aspects, such as student success and educator effectiveness. Based on Karacabey et al. (2020), leadership is a collective activity in that all members of the organization are involved and prioritized. At the same time, the ongoing process of change in education implies the provision of high-grade and exceptional instruction to pupils in schools.

This study seeks to investigate the association between teacher leadership (TL), principal instructional leadership (PIL), teacher self-efficacy (TSE) as well as teacher professional learning (TPL). In order to deepen the understanding of determinants affecting TPL practices among teachers in Kelantan, the study objectives are as given below:

1. To identify the level of teacher leadership, principals' instructional leadership, teacher self-efficacy as well as teacher professional learning in secondary schools in Kelantan.
2. To investigate the relationship between teacher leadership, principal instructional leadership, teacher self-efficacy as well as teacher professional learning in secondary schools in Kelantan.
3. To investigate the influence of principal instructional leadership and teacher self-efficacy as a mediating factor on the relationship between teacher leadership and teacher professional learning in secondary schools in Kelantan.
4. Developing a proposed framework for teacher professional learning that incorporates teacher leadership, principal instructional leadership, and teacher self-efficacy.

LITERATURE REVIEW

Teacher Leadership (TL)

York-Barr and Duke (2004) define teacher leadership (TL) as the individual empowerment of teachers as well as bringing management to the teachers' level. It is stated by Liu et al. (2023) that teachers who are granted more authority over the school policies and an exceeding degree of autonomy in their careers are more inclined to stay in the teaching profession. TL is the practice of teachers actively participating in shaping and guiding school-wide practices and policies, extending their influence beyond the boundaries of their classrooms. This concept is aligned with the Leadership Development for Teachers Model by Katzenmeyer and Moller (2009), which suggests teachers as "leaders outside and inside the classroom; identify with and help a community of teacher learners and leaders; influence others to enhance their teaching practice; as well as accept responsibility for realizing the goals of their leadership." Although several definitions and conceptions of TL are abound, scholars agree that it goes beyond the classroom to influence the general standard of school instruction. This study used seven domains to clarify the function of TL according to Katzenmayer and Moller's framework: (1) self-awareness; (2) leading change; (3) communication; (4) diversity; (5) instructional proficiency; (6) continuous improvement; as well as (7) self-organizing. Although the literature emphasizes how effective TL is for improving schools, little empirical study, especially looking at how it affects TPL, is available. In addition, research often fails to take into account the specific circumstances of secondary schools in Malaysia, specifically in the region of Kelantan. The goal of this paper is to

eliminate these gaps by investigating the direct as well as indirect effects of TL on professional learning practices in a given environment.

Principal Instructional Leadership (PIL)

Over the past five decades, many research efforts have been witnessed in different leadership styles used by school principals. The types of leadership include transformational leadership, instructional leadership, and distributed leadership. Although disagreements have always arisen, there has been increased agreement since the 1990s that instructional leadership is an important role of the principals. Considering that multiple studies offered clear evidence of the positive effects of the teaching-focused managerial method on school performance and student outcomes, one may affirm this claim. In a study by Groenewald et al. (2023), it was discovered that principles showing evidence-based practice in relation to the instructional facet of their work appear to be encouraging more success for students and better teaching. Huang et al. (2024) further depicted how schools with proficient instructional leadership are more likely to be provided with concerns of professional development, instructional uniformity, and collaboration among the teachers. Additionally, studies conducted by Shamila Meshaz et al. (2022) showed that instructional leadership needs to be adopted in a bid to enhance teacher's job satisfaction and commitment, therefore impacting the overall school climate.

The major and widely accepted theoretical framework in instructional leadership research was developed by Hallinger and Murphy (1985) with three dimensions, as previously mentioned: (1) Defining the school's mission, (2) Managing the instructional programme, and (3) Promoting a positive school climate (Hallinger & Murphy, 1985; Ismail, Don, Husin, & Khalid, 2018; Liu & Hallinger, 2018; Meyer et al., 2022). This framework suggests that instructional leadership concerns the principal's obligation for guiding, equiping, and supporting teacher's and student's efforts to acknowledge the school's instructional assignment and teaching-learning goal.

According to the research conducted by Tengku Ariffin and Nordin (2024), it is evident that the instructional leadership demonstrated by principals notably bolsters the professional learning of teachers. For example, Lin et al. (2022) study of Chinese elementary schools found a strong and favorable relationship between PIL and teachers' professional development. This implies that when principals motivate and cultivate their staff, teachers are more likely to participate in collaborative endeavors with the principal, specifically in the area of instructional leadership, as demonstrated by this study.

One such study is Kim and Lee (2020), which uses data from the Teaching and Learning International Survey (TALIS) to show that PIL and decentralized leadership are critical to teacher-professional learning. More specifically, the data suggest that both supportive school culture and teacher collaboration are additional constructs of overall TPL. Hence, the current study provides more information on the fact the relationship between instructional leadership and TPL is stronger than the relationship between distributed leadership and TPL. Notably, instructional leadership, which improves teachers' methods of teaching, largely influences teachers' pedagogical views in that way, considerably promoting the professional development of teachers. There exists many literature on instructional leadership, but there is no full understanding of how PIL practices impact the relationship between TL and TPL practices in secondary schools in Kelantan. This study seeks to fill this gap by discussing empirical data on the impact of concept instructional leadership on TPL within this distinct setting.

Teacher Self-Efficacy (TSE)

Several scholars have emphasized the significance of TSE as a crucial factor influencing TPL and thereby enhancing the educational process, including learning and teaching (Boeve-de Pauw wt. al, 2022; Thien & Yeap, 2023). Based on Bandura's Social Cognitive Theory, one's belief in their ability to succeed in particular circumstances determines how individuals think, perform, and feel. TSE in the context of education is teachers' opinions about their capacity to impact student outcomes and teach with effectiveness. That approach leads Tschannen-Moran & Hoy (2001) to develop the concept of TSE comprising three dimensions: (1) efficacy for instructional strategies, (2) efficacy for classroom management as well as (3) efficacy for student engagement.

Moreover, Şen and Yildiz Durak (2022) have determined the fact that TSE is a critical indicator of teachers' continuous learning, which can improve their performance and lead to better results in terms of education. Besides, Kılınç et al. (2021) have stressed that TSE is a powerful instrument for improving teachers' quality and achieving the organization's goals. Even though the information provided above is highly advantageous to understand that the idea of self-efficacy is critical in encouraging teacher performance and student outcomes, there are relatively few studies that touch upon the relationship between TL and professional development and the role of TSE in it. The study suggests that TSE can act as a mediator, thus shedding some light on the correlation between TL and the promotion of development strategies. In turn, it may help to uncover various perspectives on the processes that encourage the efficient promotion of professional development.

Teacher Professional Learning (TPL)

Teacher professional learning (TPL) practices are what teachers do in their ongoing education activities to improve their pedagogical skills. This culture of learning is essential to keep up with new and emerging educational demands. Consequently, the learning concept is regularly related to the education sector in the context of an idea to support the professional development of teachers and the learning of students (Bektaş et al., 2020; Chua et al., 2020; Wang & An, 2023). Thien et al. (2022) proposed a definition of TPL, stating it as a socially constructed learning and development process that takes place in the school context. The latter perspective has been further described by Thien et al. (2023), who support the idea that teachers' learning must diversify by learning being viewed as formal and informal through the formal and informal, within and beyond school, and networks and interactions between school include planned school meetings, action research groups, or collaborative work and curriculum development teams. For example, Thien et al. (2023) also argued that teacher interaction is essential to professional development, with outside such as conferences or workshops being considered. In this regard, TPL has been conceptualized as an activity involving the movement of teachers who gain new knowledge regarding their subject expertise and pedagogical practices to enhance their teaching performance. Thus, based on the dimensions developed by Liu et al. (2016), it is necessary to focus on such dimensions: (1) Collaboration, (2) Reflection, (3) Experimentation as well as (4) Extension to the Knowledge Base.

Despite the fact that professional learning is achieving greater recognition, there is no evidence of any comprehensive studies with regard to the way in which the variable of the leadership style fits into the notion of professional development within the context of Kelantan's secondary schools. This research is designed to acquire a closer insight by concentrating on the mediating role of PIL and TSE into the way in which variable of TL influences TPL practice.

The Role of Principal Instructional Leadership (PIL)

In this context, PIL is a hypothetical construct that leads to the mediating variable. It must then affect the perceived TL and TPL practices. PIL sets out a school mission and goals to raise student achievement, managing and monitoring curriculum and instruction to ensure more time on content, establishment of a safe and orderly climate supporting professional development, manage people in the organization to promote student learning, promote instruction supporting standards and assessments. By examining PIL as a mediator, this study seeks to uncover the paths via TL that may influence TPL practices.

More to the point, if administrative leaders are actively engaged in instructional leadership, this creates a supportive environment for teacher leaders, in which they are provided with the necessary tools, professional development, and feedback. As a result, this provokes higher levels of self-efficacy among teachers that affect their willingness to belong to teacher leaders and professional learning communities in general. Thus, it is possible to state that the positive influence of TL on TPL can be amplified by the presence of instructional leadership due to the fact that teachers can feel more protected and able.

In addition, PIL can affect the professional learning culture within a school by building an environment that facilitates

continuous improvement in the learning process. When a principal is more inclined to be a leader in instruction, school teachers tend to appreciate professional learning more. In consequence, teachers are promoted to take part in activities and to collaborate more with staff teachers to continually develop instructional practices.

The purpose of the study that investigates PIL as a mediating variable is to identify the further mechanisms that describe the relationship between TL and practices of professional learning. It shows that being an effective school principal implies encouraging TL that, in turn, ensures better educational outcomes. Such a mediation model can also help in revealing the indirect effects of TL, as well as developing the interventions aimed at enhancing instructional leadership practices, which will facilitate the creation of professional learning environments for teachers in the case of secondary schools in Kelantan.

Teacher Self-Efficacy (TSE) as a Mediating Variable

Besides the different roles that teachers may play as leaders in schools, there are additional roles and responsibilities teachers may accept, such as mentoring, facilitating professional development workshops, and assisting schools in making decisions. These leadership opportunities enable teachers to exhibit their capabilities, solicit others' input, and observe the outcomes of their work, which is likely to increase their self-efficacy. Teachers' self-efficacy for TL will increase if they are successful in these roles and receive recognition, which enhances their confidence in their capability to perform their jobs effectively.

The study offers an understanding of the processes by which TL might promote a culture of professional learning by looking at the mediation role of TSE. It emphasizes the need to help teacher leaders in methods that increase their self-efficacy—that is, by means of appreciation, professional growth chances, and helpful criticism. Knowing this mediating effect helps one to design focused interventions that improve TSE, therefore optimizing the influence of TL on professional development processes. This study advances knowledge of how empowered teacher leaders might result in more successful professional development and finally help to raise secondary school Kelantan's instructional results.

Drawing from the literature review above, the relationship between TL, PIL, TSE, and TPL practices presents a complex yet coherent framework vital for promoting educational excellence, underscoring the necessity for this study. Therefore, a positive relationship is expected to exist among TL, PIL, TSE, and TPL. Hence, the following hypotheses were proposed:

H1 – Teacher leadership (TL) is positive and significantly related to principal instructional leadership (PIL) in secondary schools in Kelantan.

H2 – Teacher leadership (TL) is positively significant related to teacher self-efficacy (TSE) in secondary schools in Kelantan.

H3 – Teacher leadership (TL) is positively significant related to teacher professional learning (TPL) in secondary schools in Kelantan.

H4 – Principal instructional leadership (PIL) is positively significant related to teacher professional learning (TPL) in secondary schools in Kelantan.

H5 – Teacher self-efficacy (TSE) is positively significant related to teacher professional learning (TPL) in secondary schools in Kelantan.

H6 – Principal instructional leadership (PIL) significantly mediates the relationship between teacher leadership (TL) and teacher professional learning (TPL) in secondary schools in Kelantan.

H7 – Teacher self-efficacy (TSE) significantly mediates the relationship between teacher leadership (TL) and teacher professional learning (TPL) in secondary schools in Kelantan.

Conceptual Framework

The proposed framework for this study is put forward in Figure 1 and encompasses four variables: TL by Katzenmeyer and Moller (2009) model, PIL adapted from Hallinger and Murphy (1985), TSE by Tschannen-Moran, Woolfolk-Hoy and Hoy (1998), and finally the TPL model by Liu et al. (2016). TL should be treated as the independent variable, while TPL must be included as the dependent one. PIL and TSE are to be considered as mediator variables. Checking all hypothesized paths will show their distinctive influences.

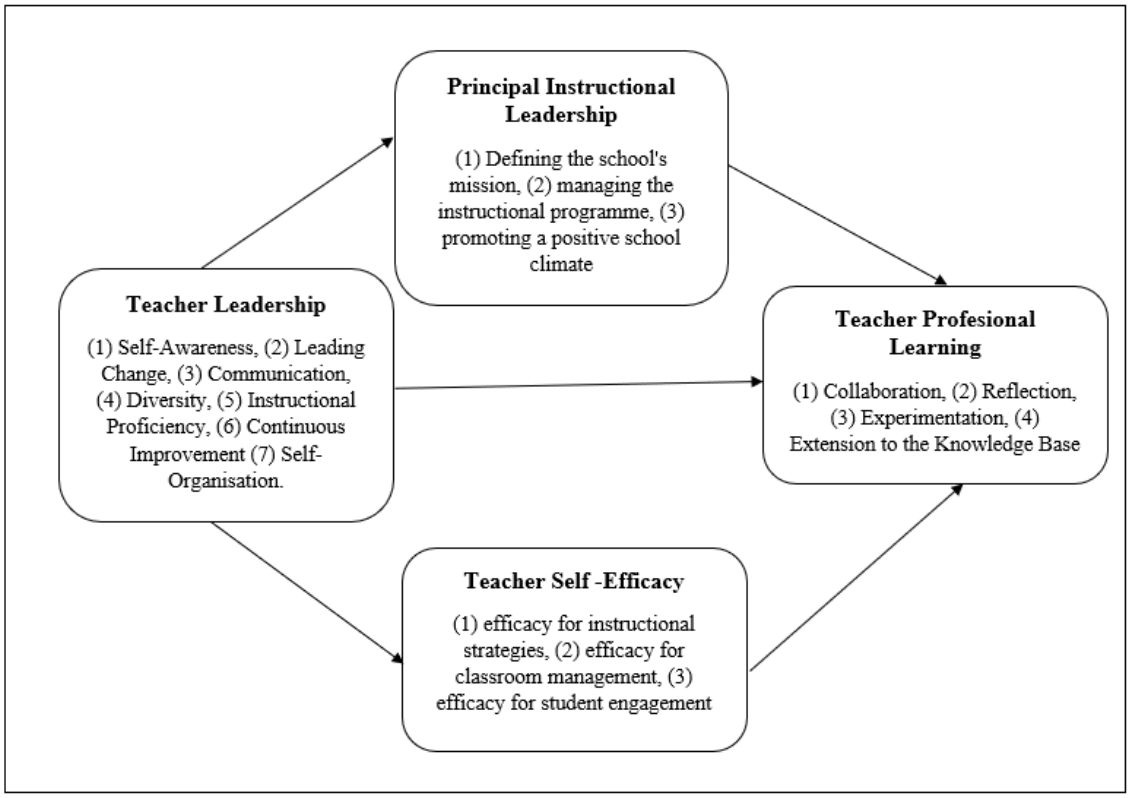


Figure 1. Conceptual Framework

METHODOLOGY

Participants

For this research, a quantitative survey was conducted to collect data from the target population. As stated by Creswell and Creswell (2018), the quantitative approach is appropriate for examining objective theories through the measurement of relationships between variables. As a result, the quantitative analysis method was used in order to measure the relationships between TL, PIL, TSE, and TPL. In addition, the study utilized a questionnaire with five sections as the research instrument.

This study utilized a cross-sectional quantitative survey design and collected data through an online survey (Google Form). The target population was secondary school teachers in Kelantan, excluding principals to avoid self-rating bias, as principals may rate their leadership practices more favorably (Bellibas & Gümüs, 2021). Teachers' perceptions of their principals' leadership were considered more reliable and valid than self-ratings (Hallinger & Kulophas, 2020; Adams et al., 2022). Proportional cluster random sampling was used to ensure equal representation of teachers from all ten districts of Kelantan. Teachers were grouped into 10 categories based on their districts. The sample size for each group was calculated based on the teacher population within each group, utilizing the formula

provided below:

$$\frac{\text{Number of teachers in the group (PPD)}}{\text{Number of teachers in government schools in Kelantan}} \times \text{sample size} =$$

(Chua,2011)

According to Table 1, the majority of participants were female (71.26%), consistent with the Malaysian Educational Statistics Quick Fact 2022, which reported that over 70% of primary and secondary school teachers were female (Ministry of Education, 2022). Regarding ethnicity, the highest proportion (95.97%) identified as Malays, followed by Chinese (3.63%) and Indians (0.38%). Academic teachers comprised the largest group of respondents (86.2%). Additionally, a substantial portion (88.69%) reported having 10 years of teaching experience, with most (90.8%) holding a bachelor's degree.

Table 1. Demographic Profile of the Respondents

Demographic	Frequency	Percentage (%)
Gender		
Male	150	28.73%
Female	372	71.26%
Race		
Malay	501	95.97%
Chinese	19	3.63%
Indian	2	0.38%
Position at school		
Senior Assistant Teachers	29	5.71%
Senior Subject Teacher	30	5.74%
Academic teachers	450	86.2%
Counsellors	13	2.53%
Teaching Experience		
Less than 5 years	12	2.33%
5 to 10 years	47	9.00%
More than 10 years	463	88.69%
Academic Qualification		
Bachelor Degree	474	90.8%
Master	46	8.81%
Doctorate	2	0.38%

Instrumentation

The selection of the research instruments for this study was based on an extensive literature review. Instruments were chosen for each study variable based on their theoretical relevance, as well as their validity and reliability demonstrated in previous research. The researcher employed adaptations of four well-established instruments: the Teacher Leadership Survey Assessment (TLSA) by Katzenmeyer and Moller (2009), the Principal Instructional Management Rating Scale (PIMRS) by Hallinger and Murphy (1985), the Teachers' Sense of Self-Efficacy Scale (TSES) by Tschannen-Moran et al. (1998), and the Teacher Professional Learning Scale (TPLS) by Liu et al. (2016a). Before administering the survey, the researchers obtained the necessary permissions from the original authors of these

scales.

To ensure the validity and reliability of the instrument, the researcher followed several key steps. For face validity, both forward and backward translation methods (Brislin, 1970) were used to translate the items. The original English items were translated into Malay by a language expert and then reviewed by experts proficient in both languages. Based on their feedback, the items were refined. A backward translation was then conducted to ensure the items retained their original conceptual meaning from the English version. The researcher employed the Content Validity Index (I-CVI) process, involving five experts in educational leadership and management to assess content validity. The I-CVI score was determined by averaging the scores assigned by each expert, resulting in the exclusion of twenty-three original items. Of the 150 items, 127 that met the criteria were utilized in pilot studies, following the methodology described by Rubio et al. (2003).

After the data collection processes were finalized for the pilot study, the researcher analyzed the 127 items employing the Smart PLS Version 4.0 with the assistance of Confirmatory Factor Analysis (CFA). There were three items whose factor loadings were under 0.05, so they were omitted from the tool that was used in the field study, and 124 items were the number of items that were utilized in the next field study: 38 items for TLSA, 47 for the PIMRS, 12 items for the TSES, and 27 items for the TPLS.

In addition, a five-point Likert-type scale, ranging from 1 “Strongly disagree” to 5 “Strongly agree,” was used for dependent variables and mediating factors. Additionally, the researcher designed survey questions with neutral wording to avoid leading questions that might influence responses. This was one of several measures taken to mitigate potential biases arising from a self-report method.

Data Collection Procedure

Before administering the survey, this study obtained human ethics approval from the university (UM. TNC2/UMREC_2595) and the educational authority at the ministry level (KPM.600-3/2/3-eras (15528)). An online survey was chosen for two primary reasons: first, it enabled researchers to collect a larger volume of data in a shorter period compared to a paper-based version (Follmer et al., 2017); second, it reduced item nonresponse by requiring respondents to complete all questions before proceeding (Hair et al., 2017). The Google Forms survey link was disseminated to respondents via social media applications, including WhatsApp and Telegram, with the consent of school leaders. Participation was strictly anonymous and confidential.

Data Analysis Procedure

In order to conduct data screening and descriptive statistics, the Statistical Program for Social Science (SPSS) version 28 was utilized to assess missing data, outliers, and straight-line bias. Fortunately, the analysis showed a minimal amount of missing data in the dataset, leading to a sample of 522 questionnaires that can be used for the final analysis. Researchers also used multivariate skewness and kurtosis statistical approaches for normality testing, as recommended by Hair et al. (2017) and Cain et al. (2017). This method was adapted because it is necessary to avoid possible misinterpretation of assumptions due to the careful consideration of the data required by the second method. The statistics of the normality test obtained with the Web Power software package present the following values: component one from -0.272 to -1.154 of skewness statistic, from -0.003 to +3.475 of kurtosis statistic. Hence, data has a normal distribution, and it is possible to use it in the next analysis. Continuing this line of interpretation, another test used in this study was the CFA via the use of Smart PLS Version 4.0 to verify the dimensionality, validity, and reliability of the latent construct measurement model. The use of analysis using PLS-SEM is recommended by Becker et al. (2023) and Sarstedt et al. (2022) for the mediator structure model. The analysis followed the two-step approach to model testing proposed by Hair et al. (2019), namely measurement model analysis (outer model) and structural model analysis (inner model). Outer model analysis covers the examination of convergent validity and discriminant validity, while structural model analysis is an analysis performed to see the relationship between latent variables or test the research hypothesis. Additionally, following Hair et al. (2021), the bootstrap method (10,000) was used to identify significant loadings, weights, and path coefficients.

RESULTS

Descriptive Analysis

The first research objective seeks to identify the level of TL, PIL, TSE, and TPL in secondary schools in Kelantan. An overall mean score under TL encompassed seven dimensions high: Self-Awareness (4.22), Leading Change (4.12), Communication (4.04), Diversity (4.13), Instructional Proficiency (4.25), Continuous Improvement (4.11), and Self-Organization (4.17).

The assessment of PIL involved evaluating 44 items that were divided into ten sub-dimensions. In the first domain of Defining the School Mission, the mean score for two sub-dimensions indicates a high level, Framing of School Goals (4.38) and Communicating the School Goals (4.25). The sub-dimensions of Supervising and Evaluating Instruction, Coordinating Curriculum, Monitoring Student Progress, and Protecting Instructional Time all received high mean scores ranging from 4.13 to 4.30 in the context of Managing the Instructional Programme. The final domain, which is Promoting a Positive School Climate, consists of four sub-dimensions: Maintaining High Visibility (4.07), Providing Incentives for Teachers (4.23), Promoting Professional Development (4.28), and Providing Incentives for Learning (4.35).

The mean scores for the domains of TSE indicate a consistently high degree of confidence among teachers in numerous aspects of their duties as teachers. More specifically, the median rating for Efficacy in Student Engagement is 4.06, indicating that teachers have a strong sense of their ability to effectively engage their pupils. Besides, the Efficacy in Instructional Strategies mean score obtained M = 4.09, which can also mean that teachers have a high level of self-efficacy for having the skills and abilities to use effective teaching techniques. On the other hand, Efficacy in Classroom Management received the mean of M = 4.07, and it presupposes that teachers have the abilities they need to manage their classrooms properly. As a result, it is possible to note that the high ratings demonstrate that teachers have a high level of self-efficacy.

The mean scores show different levels of participation among teachers in different professional learning approaches. Teachers demonstrate significant engagement in Collaboration, as evidenced by a mean score of 4.26, which indicates a robust degree of participation in collaborative activities with their colleagues. Similarly, the mean score for Reflection is 4.09, suggesting that teachers often participate in reflective techniques to improve their teaching. The utilization of the Knowledge Base demonstrates high engagement, as evidenced by a mean score of 4.00, suggesting proactive efforts to seek and utilize educational resources. On the other hand, the mean score for Experimentation is 3.94, indicating a moderate level of engagement in testing new teaching approaches or strategies. These scores offer valuable information on the level of teacher engagement in different professional learning methods, emphasizing both areas of expertise and possible areas for improvement in professional development programs.

Common Method Variance

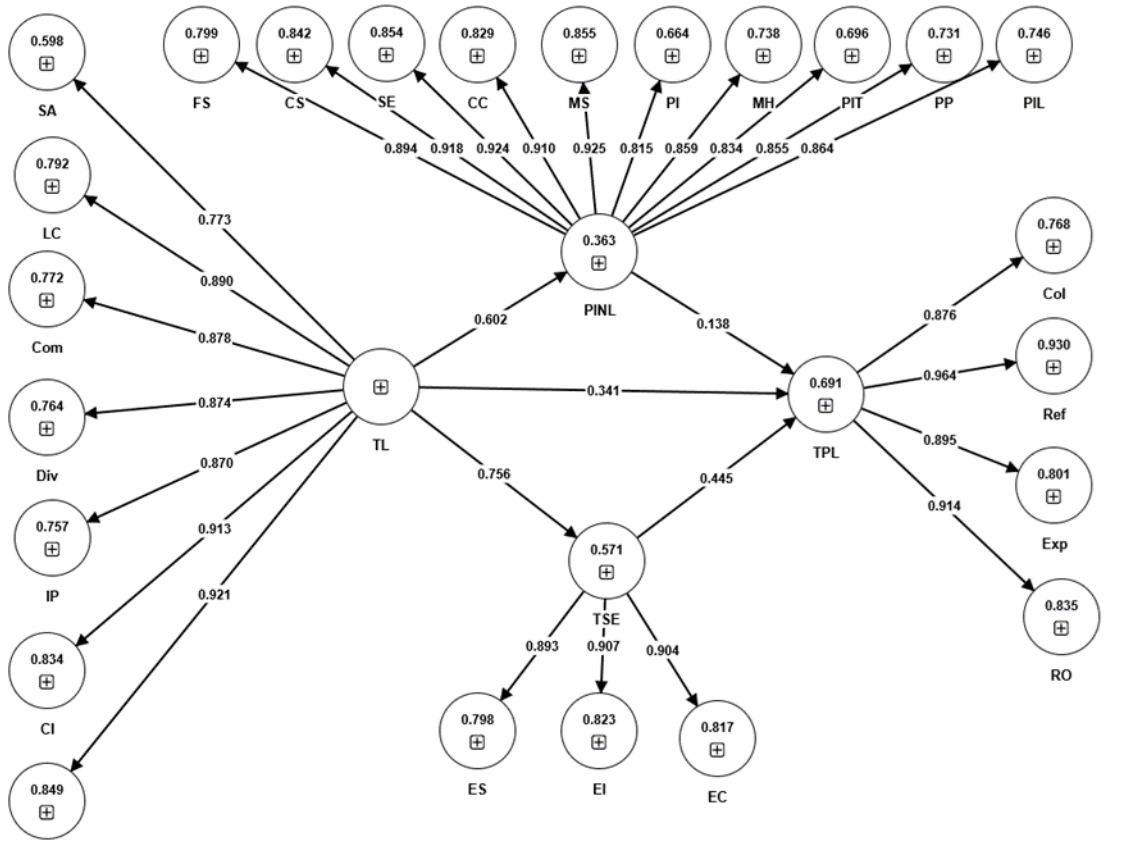
To explore the possible problem of common method variance in this study, the Harman single-factor test has been employed. The test revealed that only 41.727% of the total variance could be explained by a single factor. Since all variables had their Variance Inflation Factor (VIF) ≤ 3.3 (Lin et al., 2015), there were no evidence of the existence of multicollinearity can be found in the current dataset.

Measurement Model

The PLS analysis measurement model encompassed several key components, including internal consistency (reliability), as well as convergent and discriminant validity of the instrument, as outlined by Hair et al. (2010) and

Hair et al. (2013). Convergent validity assesses whether a specific item effectively measures the latent variable it intends to represent, as articulated by Urbach and Ahlemann (2010). The established criteria for the measurement test constructs stipulated that all item loadings should exceed 0.7, following the recommendation by Byrne (2016). Furthermore, item reliability, as elucidated by Henseler et al. (2015), necessitates that items correlate appropriately with their respective constructs, as implied by the item loadings. Additionally, composite reliability, denoting the shared variance among observed variables measuring a fundamental construct, should surpass 0.7, aligning with the criteria proposed by Fornell and Larcker (1981) and Sarstedt et al. (2022). Simultaneously, the Average Variance Extracted (AVE) should exceed 0.5, indicating that, on average, a latent variable can explain more than half of the variance of its indicators. The AVE evaluates the proportion of variance captured by a construct relative to the amount attributable to measurement error, consistent with the guidelines outlined by Henseler et al. (2015). Consequently, one item from the TL sub-construct instructional proficiency was removed due to loadings below 0.5, rendering them unsuitable for retention. This removal resulted in increased composite reliability and AVE values, enhancing the overall robustness of the measurement model, as depicted in Figure 2. Additionally, this study adopted composite reliability scores for construct reliability, as recommended by Hair Jr et al. (2020). Tables 6 and 7 present the elevated composite reliability scores for all latent variables, exceeding 0.7, and AVE values surpassing 0.5, thereby affirming the validity and reliability of the measurement model.

Figure 2. Measurement model



Note. Values inside construct – AVE. Vales on arrows = factor loadings

The result of the measurement model in Table 6 indicates that the measurement model results exceeded the recommended values, thus indicating sufficient convergence validity (Figure 2).

Table 6. Loading, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Dimensions	Item	Loading	CR	AVE
Teacher Leadership	Self-Awareness	SA1	0.813	0.857	0.666
		SA2	0.834		
		SA3	0.801		
	Leading-Change	LC1	0.756	0.91	0.627
		LC2	0.769		
		LC3	0.821		
		LC4	0.778		
		LC5	0.817		
		LC6	0.81		
	Communication	Com1	0.779	0.89	0.618
		Com2	0.816		
		Com3	0.819		
		Com4	0.773		
		Com5	0.742		
	Diversity	Div1	0.751	0.886	0.563
		Div2	0.762		
		Div3	0.745		
		Div4	0.754		
		Div5	0.749		
		Div6	0.742		
	Instructional -Proficiency	IP1	0.816	0.917	0.688
		IP3	0.836		
		IP4	0.779		
		IP5	0.868		
		IP6	0.846		
	Continuous-Improvement	CI1	0.812	0.924	0.669
		CI2	0.844		
		CI3	0.833		
		CI4	0.795		
		CI5	0.857		
		CI6	0.761		
	Self-Organization	SO1	0.781	0.928	0.683
		SO2	0.803		
		SO3	0.859		
		SO4	0.847		
		SO5	0.834		
		SO6	0.832		
Principal Instructional Leadership	Framing the School Goals	FS1	0.861	0.933	0.7
		FS2	0.876		
		FS3	0.865		
		FS4	0.759		
		FS5	0.811		
		FS6	0.843		
	Communicating the School Goals	CS1	0.88	0.942	0.729
		CS2	0.878		

		CS3	0.857		
		CS4	0.862		
		CS5	0.805		
		CS6	0.839		
		SE1	0.8		
		SE2	0.8		
	Supervising and Evaluating Instruction	SE3	0.838	0.941	0.725
		SE4	0.755		
		SE5	0.773		
		SE6	0.748		
		CC1	0.84		
	Coordinating in Curriculum	CC2	0.878	0.902	0.698
		CC3	0.813		
		CC4	0.807		
		MS1	0.824		
		MS2	0.863		
	Monitoring Student Progress	MS3	0.871	0.937	0.714
		MS4	0.839		
		MS5	0.852		
		MS6	0.82		
		PI1	0.881		
	Protecting Instructional Time	PI2	0.869	0.873	0.698
		PI3	0.749		
		MH1	0.806		
		MH2	0.835		
	Maintaining High Visibility	MH3	0.827	0.91	0.628
		MH4	0.785		
		MH5	0.738		
		MH6	0.758		
		PIT1	0.739		
	Providing Incentives for Teachers	PIT2	0.713	0.93	0.768
		PIT3	0.764		
		PIT4	0.708		
		PP1	0.772		
	Promoting Professional Development	PP2	0.761	0.939	0.838
		PP3	0.812		
		PIL1	0.901		
	Providing Incentives for Learning	PIL2	0.923	0.934	0.825
		PIL3	0.9		
		ES1	0.863		
	Efficacy in Student Engagement	ES2	0.875	0.9	0.695
		ES3	0.87		
		ES4	0.716		
		EI1	0.801		
Teacher Self-Efficacy	Efficacy in Instructional Strategies	EI2	0.872	0.91	0.718
		EI3	0.863		
		EI4	0.851		
		EC1	0.881		
	Efficacy in Classroom Management	EC2	0.891	0.932	0.773
		EC3	0.902		

Teacher Professional Learning	Collaboration	EC4	0.842	0.947	0.747
		Col1	0.801		
		Col2	0.863		
		Col3	0.872		
		Col4	0.902		
		Col5	0.846		
		Col6	0.842		
	Reflection	Ref1	0.752	0.947	0.642
		Ref10	0.823		
		Ref2	0.835		
		Ref3	0.818		
		Ref4	0.783		
		Ref5	0.798		
		Ref6	0.72		
		Ref7	0.845		
		Ref8	0.817		
		Ref9	0.814		
	Experimentation	Exp1	0.814	0.925	0.713
		Exp2	0.898		
		Exp3	0.882		
		Exp4	0.865		
		Exp5	0.709		
	Reach out to the knowledge base	RO1	0.818	0.916	0.644
		RO2	0.781		
		RO3	0.817		
		RO4	0.808		
		RO5	0.798		
		RO6	0.792		

Note: IP2 was removed due to low loading.

Table 7. Construct Reliability

Variables	Dimensions	Reliability(α)
Teacher Leadership	Self-Awareness	0.892
	Leading-Change	0.892
	Communication	0.842
	Diversity	0.857
	Instructional -Proficiency	0.838
	Continuous-Improvement	0.89
	Self-Organization	0.772
Principal Instructional Leadership	Framing the School Goals	0.968
	Communicating the School Goals	0.968
	Supervising and Evaluating Instruction	0.978
	Coordinating in Curriculum	0.978
	Monitoring Student Progress	0.978
	Protecting Instructional Time	0.978
	Maintaining High Visibility	0.97
	Providing Incentives for Teachers	0.97
	Promoting Professional Development	0.97
	Providing Incentives for Learning	0.97

Teacher Self-Efficacy	Efficacy in Student Engagement	0.856
	Efficacy in Instructional Strategies	0.856
	Efficacy in Classroom Management	0.856
Teacher Professional Learning	Collaboration	0.913
	Reflection	0.952
	Experimentation	0.92
	Reach out to the knowledge base	0.918

Construct Validity

Construct validity can be evaluated through two methods: convergent validity and discriminant validity, as suggested by Chin (1998) and Hair Jr. et al.(2014). Assessing construct validity involves examining both convergent and discriminant validity aspects. Convergent validity is confirmed when three criteria are met: all individual items exceed 0.7, composite reliability is above 0.7, and the AVE (Average Variance Extracted) exceeds 0.5 (Fornell & Larcker, 1981). In contrast, discriminant validity is achieved when the square root of the AVE surpasses the correlation value between latent variables and cross-loadings as well as meets the requirements of the Heterotrait Monotrait (HTMT) test (Henseler et al., 2015). Traditional methods for assessing discriminant validity, such as cross-loading and the Fornell-Larcker criterion, were omitted in this study due to their decreasing relevance in Partial Least Squares Structural Equation Modeling (PLS-SEM), especially when factor loadings within a construct exhibit minor variations (Hair et al., 2020). Conversely, the Heterotrait-Monotrait Ratio of Correlations (HTMT) provides a more recently introduced and precise measure for this purpose. Table 8 indicates that the HTMT values for Teacher Self-Efficacy (TSE) with Principal Instructional Leadership (PIL), Teacher Leadership (TL), and Teacher Professional Learning (TPL) were 0.605, 0.761, and 0.737, respectively. These values are below the commonly recommended threshold of 0.85 (Kline, 2011), suggesting that the constructs are adequately distinct from each other.

Table 8. Heterotrait-Monotrait Ratio of Correlations (HTMT)

Variables	Principal Instructional Leadership	Teacher Leadership	Teacher Profesional Learning	Teacher Self - Efficacy
Principal Instructional Leadership				
Teacher Leadership	0.554			
Teacher Professional Learning	0.625	0.691		
Teacher Self -Efficacy	0.605	0.761	0.737	

Structural Model

Table 9 shows the result of the direct relationship in the structural model. Overall, the results of the hypothesis testing provide evidence that there are statistically significant positive relationships between TL and all three dependent variables: PIL, TSE, and TPL. The results reveal a robust and positive association between TL and PIL (H1: $\beta = 0.602$, $p = 0.000$, $t = 20.339$). Likewise, there exists a significant positive correlation between TL and TSE (H2: $\beta = 0.756$, $p = 0.000$, $t = 37.949$), as well as between TL and TPL (H3: $\beta = 0.341$, $p = 0.000$, $t = 8.053$). These findings strongly support hypotheses H1, H2, and H3.

Furthermore, the study assessed the relative significance of exogenous variables in predicting the dependent variable, TPL. It becomes evident that TSE (H4: $\beta = 0.445$, $p = 0.000$, $t = 10.548$) emerged as the most crucial predictor, while PIL (H5: $\beta = 0.138$, $p = 0.000$, $t = 4.229$) ranked as the least influential predictor of TPL.

Table 9. Hypothesis Testing for a direct relationship

Hypothesis	Relationship	Beta Values	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Result
H 1	TL -> PINL	0.602	0.603	0.03	20.339	0.000	Supported
H 2	TL -> TSE	0.756	0.756	0.02	37.949	0.000	Supported
H 3	TL -> TPL	0.341	0.342	0.042	8.053	0.000	Supported
H 4	PINL -> TPL	0.138	0.138	0.033	4.229	0.000	Supported
H 5	TSE -> TPL	0.445	0.445	0.042	10.548	0.000	Supported

On the contrary, the results detailed in Table 10 shed light on the mediation hypothesis. This study employed Bootstrapping, a method advocated by Preacher and Hayes (2004, 2008), to scrutinize the research objective. According to Preacher and Hayes (2004, 2008), the presence of a significant mediation can be deduced if the confidence interval excludes 0. As depicted in the table below, substantial mediating effects were detected, lending support to the indirect associations. Specifically, TSE manifested a noteworthy mediating impact on the link between TL and TPL (H5: $\beta = 0.493$, $t = 16.47$, $p < 0.000$, LL = 0.281, UL = 0.391), while PIL similarly showcased a significant mediating influence on this connection (H6: $\beta = 0.134$, $t = 5.601$, $p < 0.000$, LL = 0.05, UL = 0.118). These findings distinctly demonstrate that both TSE and PIL assume mediating roles in the relationship between TL and TPL.

Table 10. Hypothesis Testing for Indirect Relationship

Hypothesis	Relationship	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/ STDEV|)	P values	BCI LL	BCI UL	Result
H 6	TL -> TSE -> TPL	0.493	0.493	0.03	16.47	0.000	0.281	0.391	Supported
H 7	TL -> PINL -> TPL	0.134	0.134	0.024	5.601	0.000	0.05	0.118	Supported

Note: We use a 95% confidence interval with a bootstrapping of 10,000

DISCUSSION

This study aims to explore the relationships among TL, PIL, TSE, and TPL. The findings of the study revealed direct associations between TL, PIL, TSE, and TPL, thereby providing support for hypotheses H1, H2, H3, H4, and H5. The study aligns with the findings of (Dzul et al., 2023; S. Liu & Hallinger, 2018; Shamila Mehnaz et al., 2022; Thien et al., 2023), which discusses the significant relationship between TL, PIL, TSE, and TPL. Moreover, they provide valuable insights for educational leaders and policymakers to design and implement effective interventions aimed at promoting teacher empowerment and cultivating professional learning cultures within schools.

Furthermore, when testing the mediation effects of PIL and TSE on the relationship between TL and TPL, significant effects were observed, thus supporting hypotheses H6 and H7. The findings of this study reveal that PIL and TSE play significant mediating roles in the association between TL and professional learning practices. By emphasizing the roles of principal leadership and TSE as mediators, this study underscores the importance of creating supportive environments that foster continuous improvement and enhance the overall quality of teaching and learning experiences for teachers and students alike. The study is consistent with the study of Bektaş et al. (2022) which indicated that principals serve as the key administrators within the school environment, responsible for setting the tone, vision, and direction for the institution. Furthermore, the result of the current study was consistent with the study of Bellibaş et al. (2021), which found that principal leadership styles, behaviours, and decisions can significantly influence the extent to which TL initiatives are supported and encouraged within the school. Moreover, the study of

(Gümüş et al. 2022; Karacabey et al., 2020; Kılınç et al., 2021) showed that TSE influences the extent to which teachers are motivated to participate in professional learning activities, take risks, and experiment with new instructional strategies. In the previous study, for example, Li and Liu (2022) contended that when teachers believe in their capabilities to contribute meaningfully to the school community and positively impact student learning outcomes, they are more likely to actively seek out opportunities for professional growth and development. Thus, TSE acts as a mediator by influencing the extent to which TL initiatives translate into tangible improvements in TPL practices. In light of the above result, this study recommended that both principal leadership and TSE serve as mediators in the relationship between TL and TPL practices. These results contribute substantially to the expanding literature on TL and professional learning by highlighting the importance of empowering both principals and teachers within educational settings.

IMPLICATIONS

In addition to providing valuable practical implications for policymakers as well as educational practitioners, this study has significant practical implications for both teachers and policymakers. For example, policymakers need to form an appropriate framework to cultivate and improve professional learning among teachers by taking into account various factors, from TL, PIL, and TSE. Policymakers must also respond to these findings by formulating strategies that prioritize the provision of principals and teacher support so that TL and collaboration can be encouraged. School administrators can also benefit from the findings of this study by revising their leadership practices to better support the growth of their teachers' effectiveness. In addition, the study suggests that teachers themselves should understand how critical TL is as a factor in determining their professional development path through self-efficacy. Using these findings can lead to an informed decision-making process, well-targeted professional development interventions, and ultimately, an effective educational environment in secondary schools located in Kelantan.

LIMITATIONS

The findings of this study need to be considered in light of certain limitations. Firstly, the study relied solely on teachers' perceptions, which may introduce concerns regarding social desirability and acquiescence bias. Despite efforts to ensure the inclusion of teachers from all schools in Kelantan, there remains a possibility of bias in the research findings. Therefore, it would be beneficial for future researchers to investigate principals' perspectives to compare differences in instructional leadership and TPL. Another limitation is the use of self-report surveys by teachers to assess their professional learning performance. This method may lead participants to agree with positive statements in the survey, potentially biasing the findings. However, although the survey data were deemed valid for this study as common method bias was not found to be a significant threat, it is essential for future research to employ diverse data collection methods such as observations and interviews. Finally, the data collection procedure utilized a cross-sectional design, which could hinder establishing causality between the variables. In this regard, future studies could benefit from employing a longitudinal design to better understand the causal relationships between variables over time.

CONCLUSION

The increasing focus on educational leadership research has spurred endeavours to understand how TL fosters professional learning among teachers within school environments. This study delved into the mediating influences of PIL and teacher self-efficacy on the relationship between TL and TPL. The findings of this inquiry significantly contribute to clarifying the dynamics among these variables and their impact on teachers' professional development within educational contexts.

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